2001

National Museum of Health and Medicine of the AFIP

Published by the
American Registry of Pathology

History of the
ARMED FORCES INSTITUTE OF PATHOLOGY

The Army Medical Museum (1862-1946)

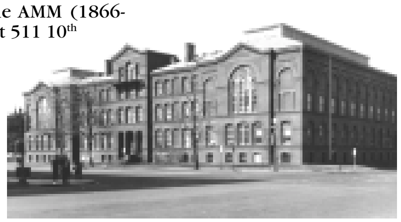
The Armed Forces Institute of Pathology originated as the Army Medical Museum (AMM), created by the May 21, 1862 directive (Circular No. 2) issued by Brig. Gen. William A. Hammond, Surg. Gen. of the Army.

> "Medical officers are directed diligently to collect, and to forward to the office of the Surgeon General, all specimens of morbid anatomy, surgical or medical, which may be regarded as valuable, together with projectiles and foreign bodies removed, and such other matters as may prove of interest in the study of military medicine or surgery."

A second Circular (No. 5) issued two-and-one-half weeks later required the preparation of the *Medical and Surgical History of the War of the Rebellion*, a large text on the lessons of the Civil War. It was written by Curators Brinton, Otis, and Huntington and Surgeons Woodward and Smart and published in six volumes between 1870-88.

The newly created AMM under first curator John H. Brinton was housed in the Surgeon General's office in the Old Riggs Bank Building on Pennsylvania Ave. at 15th St., NW, Washington, DC. In the next two years, the Museum relocated twice, first to 180 Pennsylvania Ave., NW and then to the Corcoran Schoolhouse at 1325 H St., NW where it remained—and grew—from 1863-66. Events occurring during those earliest years established the national role of the Museum. Most notable was the participation of its staff in the autopsies of President Abraham Lincoln (April 15, 1865) and his assassin John Wilkes Booth (April 29, 1865). Materials from those procedures include a lock of Lincoln's hair (a DNA source for possible diagnosis of Marfan's disease). Eventually, the fatal bullet also became part of the Museum's collections.

The fourth home of the AMM (1866-1887) was Ford's Theatre at 511 10th Street, NW which had closed immediately following Lincoln's assassination. During this twenty-year period, the collections expanded to "embrace all forms of injuries and diseases." Autopsies of a second President (James Garfield) and his assassin (Charles J. Guiteau) were performed by Museum staff (September 19, 1881 and June 30, 1882).



"Old Red Brick"

In 1888, the AMM and Library moved to a new facility, the "Old Red Brick," built by government appropriation at 7th St. and Independence Ave., SW. As a consequence of a change in focus to disease prevention, Major Walter Reed, fifth Curator, headed the Yellow Fever and Typhoid Fever Commissions. The work of Reed and Drs. James Carroll, Jesse W. Lazear and Aristides Agramonte in Cuba enabled William C. Gorgas to eradicate yellow fever (1900) and permitted the construction of the Panama Canal. Reed (until his death in 1902) and Carroll attacked typhoid fever (1904); Frederick F. Russell designed a vaccine against it (1911) which was made compulsory for the Army, the first time a program of prevention was carried out in the military.

In 1918, Surg. Gen. Gorgas sent detailed instructions to all military hospitals to submit properly prepared autopsy material for the purpose of "studying the natural history of disease." By 1929, the emphasis of the AMM was changed to consulting with civilian doctors and examining and diagnosing surgical, biopsy, and autopsy material for the military.

National Museum of Health and Medicine (NMHM)

Following the 1888 move to the "Old Red Brick," the AMM acquired a number of historical collections that increased its reputation as the major repository of medical history and information. Maj. John S. Billings enlarged the collection of microscopes begun two years earlier. The collection now totals 665 instruments dating to the early 1600s.

With the creation of the Army Institute of Pathology in 1946, the AMM was reorganized into a separate division. The following year, the Museum moved to Chase Hall on Independence Avenue, back into the "Old Red Brick" in the mid 1960s, and then to its present location as part of the South Wing of AFIP on the Walter Reed Army Medical Center campus in 1971. It was renamed the Armed Forces Medical Museum in 1974 and the National Museum of Health and Medicine of the AFIP in 1989. The Hirshhorn Museum was built on the site of the red brick building.

The Museum's holdings are distributed within five divisions. The Otis Historical Archives contain the records of the Museum since 1862, Civil War photographs, monographs (including Sir Isaac Newton's 1718 treatise on optics), and scientific and medical papers (Drs. Peyton Rous and George H. Whipple).

The Historical Collections contain medical artifacts and instruments important in the development of medicine.

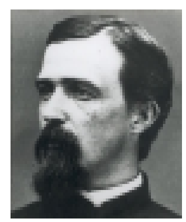
Skeletal remains, gross anatomical and pathological specimens and miscellaneous items of medical interest form the core of the Anatomical Collections. Included are the Cornell Medical College Pathology Collection, 1850-1990, the Milton Helpern, MD, New York City Medical Examiner Collection, 1940-1970, and the Peruvian collection, ca. 3000 BC, of mummies and skeletons.

In 1994, the Neuroanatomy Repository (now the Neuroanatomical Collections) was formed to house the Yakvolev Haleem Collection of Normal and Pathological Anatomy and Development of the Human Brain from Harvard Medical School. Other collections include the John I. Johnson Comparative Anatomy Collection (mammalian brains) and the Blackburn-Neuman Collection of neuropathological specimens.

The Human Developmental Anatomy Center accommodates the Carnegie Human Embryology Collection, the Elizabeth Ramsey Embryology Collection from Carnegie Institution of Washington, and others.

National Library of Medicine (NLM)

In 1883, the Surgeon General's Library, created in 1838, was merged with the AMM to become the Museum and Library Division of the Surgeon General's Office; Maj. Billings was appointed Curator and Librarian. He is acknowledged as one of the foremost librarians in the field of medicine. The Surgeon General's Library was incorporated into the National Library of Medicine (NLM) upon its creation in 1956. Although the original plan was to house the Library on the Walter Reed Campus, it was located instead on the grounds of the National Institutes of Health (1963). The NLM has a separate Board of Regents, and its Director has dual responsibility to this board and the NIH for funding.



Dr. John Shaw Billings

Walter Reed Army Institute of Research (WRAIR)

In 1893, Brig. Gen. George M. Sternberg, Surg. Gen. of the Army, issued orders to establish the Army Medical School with classes taught by Museum staff in the AMM beginning in 1894. The Army Medical School became a separate entity as the Medical Department Professional Service Schools (1923) and relocated to the Walter Reed Army Medical Center that same year. It became the Army Medical Department Research and Graduate School in 1947. The school markedly extended its program as the primary research center for the Army's Infectious Diseases program and became known as the Walter Reed Army Institute of Research (WRAIR) (1953). It will move to the Walter Reed annex at Forest Glen this year.

American Registry of Pathology (ARP)

In 1895, the American Dental Association formally recognized the role of the AMM as a national repository by depositing its pathological specimens. The change in mission of the Museum by the 12th Curator, Maj. George R. Callendar (1922), to "collect, educate, research, inform" led to the recognition that some mechanism of finalizing diagnoses needed to be established. This recognition closely coincided with the establishment of the Registry of Ophthalmic Pathology (1921) as a committee of specialists sponsored by the American Academy of Ophthalmology and Otolaryngology. Their purpose was to archive rare eye tumors. In 1930, the American Registry of Pathology (ARP) was formally recognized as a collection of Registries to assemble data and specimens from living patients. Curator of the Army Medical Museum, COL. J. E. Ash, encouraged the addition of many more Registries. Gradually, over 35 registries were formed.

Dr. Chapman H. Binford

In 1976, the efforts of Senators E. Kennedy (D-MA) and S. Nunn (D-GA), R. Stowell (Scientific Director of the AFIP), and Gen. J. Blumberg (Director of the AFIP) resulted in Congress recognizing ARP as a 501c(3) foundation to serve as a liaison between the military and civilian communities. It was given the authority to publish books, accept research grants, and receive consultation and tuition fees. The ARP became the fiduciary agent for consultation and educational revenues, and took over the contracts for editorial supervision and production of the fascicles.

Armed Forces Institute of Pathology (AFIP)

In recognition of the evolution of the missions of the AMM, the Army Institute of Pathology (AIP) was created (1944) as a sub-unit of the Museum. This relationship was reversed in 1946 when the AIP was recognized as the primary organization. A cooperative agreement was forged with the Veterans Administration and, in 1949, the AIP was designated as the central laboratory of pathology for all of the Armed Forces (Army, Navy, Air Force). On July 1, 1949, it was officially renamed the Armed Forces Institute of Pathology (AFIP) to reflect its expansion to include the other branches of the military. President Dwight D. Eisenhower dedicated a new atomic bomb-resistant building on the Walter Reed Campus in 1955.

Major undertakings of the early AFIP included the Atomic Bomb Research Unit (1948), that led to a 50-year follow-up study of 26,735 survivors of the Hiroshima and Nagasaki bombings. Other research studies ranged from trauma injuries to the effects of various kinds of radiation and toxic agents on cells and organisms to leprosy, tumors, structures and functions of tissues, and foreign animal diseases (foot-and-mouth disease, rinderpest, African swine fever, hog cholera, Venezuelan equine encephalitis and others).

The Joint Committee on Aviation Pathology (1955) monitored effects of space flight on the first mice, monkeys, and men sent into orbit by NASA (1956-62) and brought AFIP expertise to civilian airplane accidents.

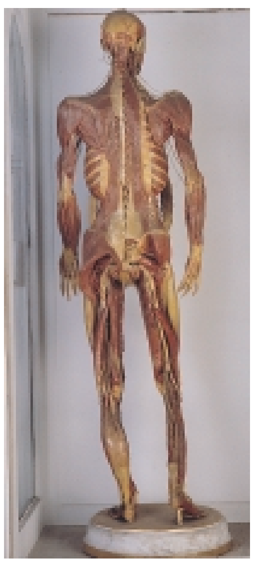
Medical Museums and Medical History

This calendar offers an overview of the National Museum of Health and Medicine of the Armed Forces Institute of Pathology. Each month highlights an important theme in medical history, and displays an assemblage of objects and images from our collections. As a whole, the calendar tells the 139-year story of our institution as a research and education organization dedicated to the understanding of disease, rooted in a single collecting effort, and growing into an internationally significant organization supporting consultation, education, and research. Remarkably, that work is still based on an unrivaled collection and the science behind that collecting effort. We are the nation's most comprehensive museum of medical history and technology, a unique organization bringing together thousands of historic and scientific items. These images are merely a glimpse into this revered and growing national treasure that tells the story of a long dedication to healing.

Established in 1862 as an attempt to understand and document the demands of military medicine and surgery, the National Museum of Health and Medicine has grown to comprise a collection shaped by many earlier efforts to address the needs of medicine and public health. We bring together anatomy and physiology, form and function, sickness and health, historical and modern activities, personal stories and universal issues. Our public face has always reflected the science behind the scenes, as the Army Medical Museum led the way in the organization of medical information, medical imaging techniques such as microscopy and photomicrography, laboratory sciences, and medical education. We have inherited rich traditions of public display, coupled today with innovative behind-the-scenes research. While many museums address medical themes, far fewer are dedicated solely to medicine.

Medical Museums and Medical History

Health and medicine have always fascinated caregivers and the general public. We owe much of our rich heritage to this fact, as the assembly of medical collections traces its origins to the oldest organized collecting efforts on earth, resulting over time in a diversity of medical museums worldwide. They are much more than fascinating places to visit. These museums advance education and research. They are the repositories of governments and our great libraries and universities, attempts of empires to create vast arrays representing their reach around the globe, and celebrated histories of enduring institutions. Their purpose may be to bring together the treasured icons of professional organizations and their members, to preserve the mortal remains of leaders, or to render clinical utility to the products of medical enterprise. They are unquestionably related to the emergence of pathology as a specialty in the late 19^{th} century. And they share one element: an organized collection of objects.



La Specola artifact, Florence

Medical museums share their origins with natural history museums. They are rooted in the great 17^{th} century European

La Specola interior, Florence

cabinets of curiosities or *Wunderkamern* of natural marvels—specimens selected for their singular forms and displayed to instill awe for their collectors' colonial domain and the richness and mystery of the natural world. Some also served as encyclopedic, well-organized representations of the world experienced by explorers, displayed to recreate the breadth of experience in a single vista. Few such examples survive, but they are well-documented in inventories listing normal and abnormal human and comparative specimens. In fact, the earliest museum catalogs were lists of anatomical holdings. Extensive catalogs of *materia medica* were also systematic museums of a sort, organizing the world's botanical riches. And just as natural objects were displayed for their utility, so were examples of technical virtuosity, many being the greatest achievements of scientific instrumentation of their day. Scientific societies became the theater for demonstrations, setting the stage for much of Western science and modern scientific methods.

Museums were adjuncts to formal lectures and were famed for their value to medical education centuries before the medical teaching models we now know became familiar. They housed interesting preparations and anatomical teaching models, some bearing spectacular likeness to the natural form. Then as now, some were stylized to convey specific messages or to appeal to certain artistic sensibilities. And in some of the major medical collections, skeletal specimens were arrayed to convey moral as well as medical lessons. In the 19^{th} century, museums came to represent the pinnacle of understanding in comparative structure and function. In a time when comparative anatomists commonly sought medical degrees, anatomy museums became the visible expressions of changing biological theory and the relationship between evolution and anatomy.

The Royal College of Surgeons Museum c. 1840.
Watercolor by T. H. Shepherd, Hunterian Museum.

Many great medical museums house libraries of books, manuscripts, images, renderings, and other documents that together convey important medical and historical information. Botanicals and herbals are routinely found on their shelves. The modern emphasis on imaging in medicine has caused many museums to expand their collections to include views inside the body

Musée d'Histoire de la Médecine, Université René Descartes, Paris

and the objects used to generate them. These photographs, drawings, and paintings link medicine to both patient and practitioner, helping us to appreciate their special relevance to one another.

Some museums are the singular effort of an individual or specific group; others represent the assembled traditions of many generations of healers. Some are significant for their comprehensive view of medical history, others for their exquisite depth in a specific clinical interest, educational value, or inspirational quality. Others are celebrated for their representation of medicine in ancient times and faraway places. These institutions provide an essential bridge between the humanities and medical science.

Some medical museums collect the special objects of our discipline—the first or last, the largest or smallest, the one owned by the most famous person. But to be truly comprehensive, a museum must also collect the everyday object, that familiar item so commonplace it may drift from our collective grasp before it is formally appreciated as part of the fabric of modern medicine. The National Museum of Health and Medicine of the Armed Forces Institute of Pathology is such a museum.

Today the National Museum of Health and Medicine welcomes visitors to our permanent exhibits on Civil War medicine, medical technology, the human body, and current medical topics. This year our special exhibitions include *Blood, Sweat and Saline: Combat Medicine in the Korean Conflict* and *The Changing Face of Women's Health*, representing our increased emphasis on using military and civilian medical history to better understand current issues in medicine and health care. Behind the scenes, hundreds of qualified researchers continue to use our collections for scientific and historical investigations.

These images represent only a small number of the world's best known medical museums. La Specola in Florence offers one of the finest collections of anatomical models. The Museum of the Medical History in Paris is a superb institutional history collection. The Museum of the Royal College of Surgeons arranges its displays into a system of organization that informs both teaching and research. This year, American Association of Museums recognizes over sixty medical museums in the Unites States alone; many more exist in Europe as national museums, as the holdings of societies and professional organizations, as university collections, and as public trusts.

Developing an Understanding of Cells and Tissues

Diatom photographed by J. J. Woodward, ca. 1876; Leeuwenhoek microscope (reproduction); Microscope used by Robert Hooke, ca. 1665; Walter Bulloch Congress binocular microscope; Electron microscope pieces; Beck catalogue page, 1870s; View of three electron microscopes; Book: *Common Objects of the Microscope* by J. G. Wood; Microscopic preparations by Abraham Ypelaar, ca. 1785.

MICROSCOPY

The workhorse of medical laboratories—the binocular compound microscope—evolved over four centuries. It began with the monocular microscope, invented by the Janssens in Holland ca. 1590, that had lenses fixed into the ends of two cardboard or metal tubes, one inside the other. Focal lengths were adjusted by sliding the tubes and later by screw and rack-and-pinion assemblies. It attained magnifications of 20-50x.

The smallest details of insects and materials seen through a microscope are recorded in *Micrographia,* published by Robert Hooke in 1665. Anton van Leeuwenhoek, a draper in Leyden, was inspired by Hooke's drawings and motivated by his own curiosity to explore the unknown world around him. By 1673, he had developed a powerful simple microscope consisting of a ground glass bead held between two metal plates. Specimens were placed on the head of a small spike. In 1674, he reported finding "animalcules" (algae, rotifers) in pond water held in a test tube. His magnification of 266x and resolving power of less than 1 mm are comparable to the standard teaching laboratory microscope of today.

Simple microscopes, portable and easy to use, remained in vogue for nearly 200 years. Only nine of the more than 550 microscopes made by Leeuwenhoek survive.

Microscopes, widespread among the privileged classes, were used both for education and entertainment. The chromatic and spherical aberrations of the 17th and 18th century microscopes were corrected in the mid-19th century by applying the new understanding of optics. A series of convex mirrors improved images. Gradually, reflecting mirrors, condensers, fixed bases, movable stages, and binocular lenses were added.

Microscopic study was a solitary endeavor. Communication of observations was interpretative,

JANUARY

S	M	T	W	T	F	S
31	New Year's Day 1	2	3	4	5	Epiphany 6
7	8	9	10	11	12	13
14	Martin Luther King Day 15	16	17	18	19	Inauguration Day 20
21	22	23	24	Chinese New Year 25	26	27
28	29	30	31	1	2	3

relying on the artistic ability of the viewer or a colleague. Reliable dyes (vegetable and aniline) and methods of fixing, sectioning, and mounting materials increased the visibility and stability of samples.

Photomicrography, developed in 1864 by Dr. J.J. Woodward with the help of Dr. Edward Curtis at the Army Medical Museum (AMM), provided permanent images. These pioneers used a focusing mirror on the rooftop of the AMM to concentrate the rays of the sun. The focused light was directed through the eyepiece of a horizontal microscope in a darkened room, through a tissue specimen on a slide and onto a photographic plate. A window shade was the shutter; the magnification was determined by changing the distance of the plate from the microscope. A tungsten lamp provided direct illumination and permitted exposures in all weather and at night.

Today, models include dissecting, inverted, dark-field, phase contrast, fluorescent, confocal and tunneling microscopes. Scanning and transmission electron microscopes have increased magnifying power to greater than 500,000x.

Badge commemorating tri-centennial of Anton van Leeuwenhoek issued at the 1932 conference of the International Tuberculosis Association, The Hague, Netherlands in 1932.

Understanding the Mechanisms of Disease

Book: *Gunshot Injuries* by Louis A. LaGarde, New York: William Wood, 1914; Civil War soldier's skull, fractured by grapeshot; Pathologist studying brain sections; Pathologist working at AFIP, ca. 1950s; Dr. Webb Haymaker examining brain; Smoker's lung; Normal human lung; Acute granulocytic leukemia cells in heart; COL James E. Ash, first head of AFIP, at his desk, 1942; Mustard gas burn on neck; New AFIP building in 1956; Histological stains, ca. 1910; Rudolph Virchow (1821-1902), the father of cellular pathology.

FEBRUARY

PATHOLOGY

The belief of ancient Greek and Roman physicians that disease was an imbalance of the four humors—blood, phlegm, yellow bile and black bile—dominated thinking about pathology up to the 19th century. Andreas Vesalius (1543) depicted realistic views of normal human anatomy that served as the bases for investigations by early anatomical pathologists. Jean Fernel published the first pathology text in 1554 and by the 17th century, pathologists were studying the effects of disease on various parts of the body.

Anatomic pathology came of age in the first half of the 18th century under the leadership of Giovanni Battista Morgagni in Padua, Italy. Through his correlation of gross morbid anatomy with clinical findings, pathology emerged as a science. In 1761, he published a compilation of 700 cases with his autopsy findings. Later, Rokitansky in Vienna conducted approximately 30,000 autopsies with detailed descriptions (1842-46), establishing that disease is an internal anatomic process expressed outwardly through signs and symptoms. In late 18th century England, John Hunter left a legacy of morbid anatomy focused on inflammation.

German physician Rudolf Virchow solidified Cell Theory by asserting that pathology was the result of changes in individual cells (1855). He emphasized the distinction between diseases caused by the reaction of the body to invading microorganisms and diseases caused by cells altered *de novo*. Technological advances, including the achromatic compound microscope (1830), tissue fixatives and paraffin embedding techniques (1880s), the mechanical microtome (1881) and development of aniline (1856) and other dyes, led to detailed analyses of diseased areas of the tissues and parts of organs that had been delineated in the final years of the 18th century by Xavier Bichat, the originator of histopathology. The pathological processes of inflammation, necrosis, degeneration, repair and neoplasia were redefined at the cellular level.

In the first half of the 19th century, French physicians Francois Magendie and Claude Bernard pioneered experimental pathology by applying new findings in physiology to the study of disease processes. Their approach expanded under Julius Cohnheim in Germany during the last half of the century. By attempting to answer the question of why certain disease processes produce structural changes, Cohnheim directed a generation of physicians to apply the new knowledge of normal organ, tissue and cell function to understanding the physiology of disease.

The 20th century approach to pathology was based on the elucidation of intracellular and extracellular biochemical and molecular reactions. Today, pathologists use a variety of sophisticated technologies to determine the extent of disease in tissue specimens. Staff pathologists at the AFIP, a major repository of pathological materials from around the world, consult cases from academia, government, industry and the private sector. Teaching materials are provided through fascicles, slide sets, CME courses and the Internet.

S	M	T	W	T	F	S
28	29	30	31	1	Groundhog Day 2	3
4	5	6	7	8	9	10
11	Lincoln's Birthday 12	13	Valentine's Day 14	15	16	17
18	Presidents' Day 19	20	21	Washington's Birthday 22	23	24
25	26	27	Ash Wednesday 28	1	2	3

Medallion presented in honor of the 70th birthday of Rudolf Virchow, 1891.

Control of Infectious Disease

Method of vaccination at Army Medical School, ca. 1918; Smallpox model by William Gottheil, ca. 1918; Commission as Brigadier General of F. F. Russell, leader of the typhoid vaccine trials; Prototype "Press-O-Jet" immunization gun, ca. 1955; Soldiers being vaccinated at Army Medical School; Vaccinated infant and mother with smallpox; Preparation of typhoid vaccine, ca. 1918; Hypodermic syringe, ca. 1940; Making smallpox vaccine, Puerto Rico, ca. 1890s; Typhoid vaccine tested by F. F. Russell.

VACCINES

Until the end of the 18th century, the two most effective means of protecting against epidemic disease were to run away or get sick and recover. In 1796, Edward Jenner recognized a third way, namely infection with a milder form of the disease. His vaccine of cowpox pus was based on the observation that milkmaids exposed to cowpox were immune to smallpox. Attenuated rabies (1885), cholera (1896) and plague (1897) vaccines were developed.

Much of the battle against epidemic disease was waged to stamp out infections that spread rapidly in crowded military quarters. One of five American soldiers came down with typhoid fever during and after the Spanish-American War (1898). A Typhoid Board, set up in 1898 and headed by Major Walter Reed of the AMM, established the typhoid bacillus as the infectious agent. Based on the experiences of the British and German armies, Captain F. F. Russell (successor to Reed) began hypodermic administration of killed typhoid bacteria to U.S. Army volunteers in 1909. The number of new cases decreased by 90%. In 1937, Joseph Siler of the Army Medical School (now Walter Reed Army Institute of Research) improved the vaccine using a more potent bacterial strain and a reliable method of inactivation.

Identification of the diphtheria (1885) and tetanus (1890) toxins and their inactivation by formalin (1920s) led to subunit toxoid vaccines. Prophylactic doses were given to wounded British and American soldiers in World War I. During WWII, tetanus toxoid immunization was made mandatory for French (1936) and U.S. (1941) military forces. Diphtheria toxoid was included in the French vaccine.

In another method of disease protection, sera from horses immunized against meningitis were injected into military personnel and civilians in WWI. The practice was discontinued due to incomplete protection and serum sickness. A subunit vaccine developed by Malcolm Artenstein (WRAIR) was administered to all recruits (1971).

Vaccines against the typhus fever rickettsia (1938) protected troops during WWII. People were immunized with heat-inactivated influenza virus (1928) and attenuated yellow fever (1937) and polio (1958) viruses. A 1911 killed pneumococcal vaccine evolved into one of purified bacterial polysaccharides protective against 23 serotypes (1983).

Vaccines for more than 25 microbial agents, including measles (1960) and rubella (1969), are now in widespread use in developed countries. Smallpox has been eliminated worldwide (1980); polio is targeted for eradication by the World Health Organization (WHO). In 1984, the first recombinant vaccine, a viral subunit, was introduced to protect against hepatitis B and possible later development of liver cancer. The current challenges are to make vaccines against HIV, malaria and other parasites.

MARCH

S	M	T	W	T	F	S
25	26	27	28	1	2	3
4	5	6	7	8	Purim 9	10
11	12	13	14	15	16	St. Patrick's Day 17
18	19	First Day of Spring 20	21	22	23	24
25	26	27	28	29	30	31

Medallion commemorating Edward Jenner's discovery of vaccination against smallpox. Date unknown.

Beginnings of Modern Military Medicine

Lincoln General Hospital, 1865; Amputation with anesthesia; Pelvis and femur from Private Julius Fabry, wounded August 16, 1864; General Daniel Sickles after amputation; General Henry Barnum showing his wound; US Army Surgeon General William Hammond, founder of the Medical Museum; Cartes des visites of Museum specimens; General Daniel Sickles' leg, amputated after Battle of Gettysburg; Private Lewis Francis, after his amputation due to an injury at the Battle of Bull Run; Museum curator John Brinton (center with beard) at Petersburg, VA, collecting for Museum, 1864; Fragments of Abraham Lincoln's skull; Lincoln's deathbed by Hermann Faber, 1865.

CIVIL WAR

The true victor in the bloody War Between the States was disease. Of the 618,000 soldiers who perished, two-thirds died from measles, dysentery and other maladies. The U.S. Army, partially equipped to deal with a peacetime force of 16,000 men, was unprepared for the million soldiers mobilized between 1861 and 1865. Diets were poor, water contaminated, proper sanitation and protection from germ-carrying insects inadequate. Medical supplies were in short supply, doctors few and poorly trained, transportation of the injured and ill disorganized. The minie ball, a conical rifle bullet, inflicted severe tissue damage that challenged surgeons unfamiliar with gunshot wounds. The first course of treatment for leg and arm wounds was speedy amputation; torso wounds were considered untreatable.

Major John Hill Brinton pioneered the combination of regimental hospitals and ambulances. Surgeon Jonathan Letterman, Medical Director of the Potomac, created a system for handling the sick and injured in which wounded soldiers were evacuated by ambulances (the Union Ambulance Corps was organized in 1864); the Confederates transported their casualties on an extensive network of railroads constructed prior to 1862. Dr. Samuel Stout of the Confederate Medical Service set up aid stations and mobile hospitals. Hospital trains and ships were used by both sides to treat and evacuate the wounded.

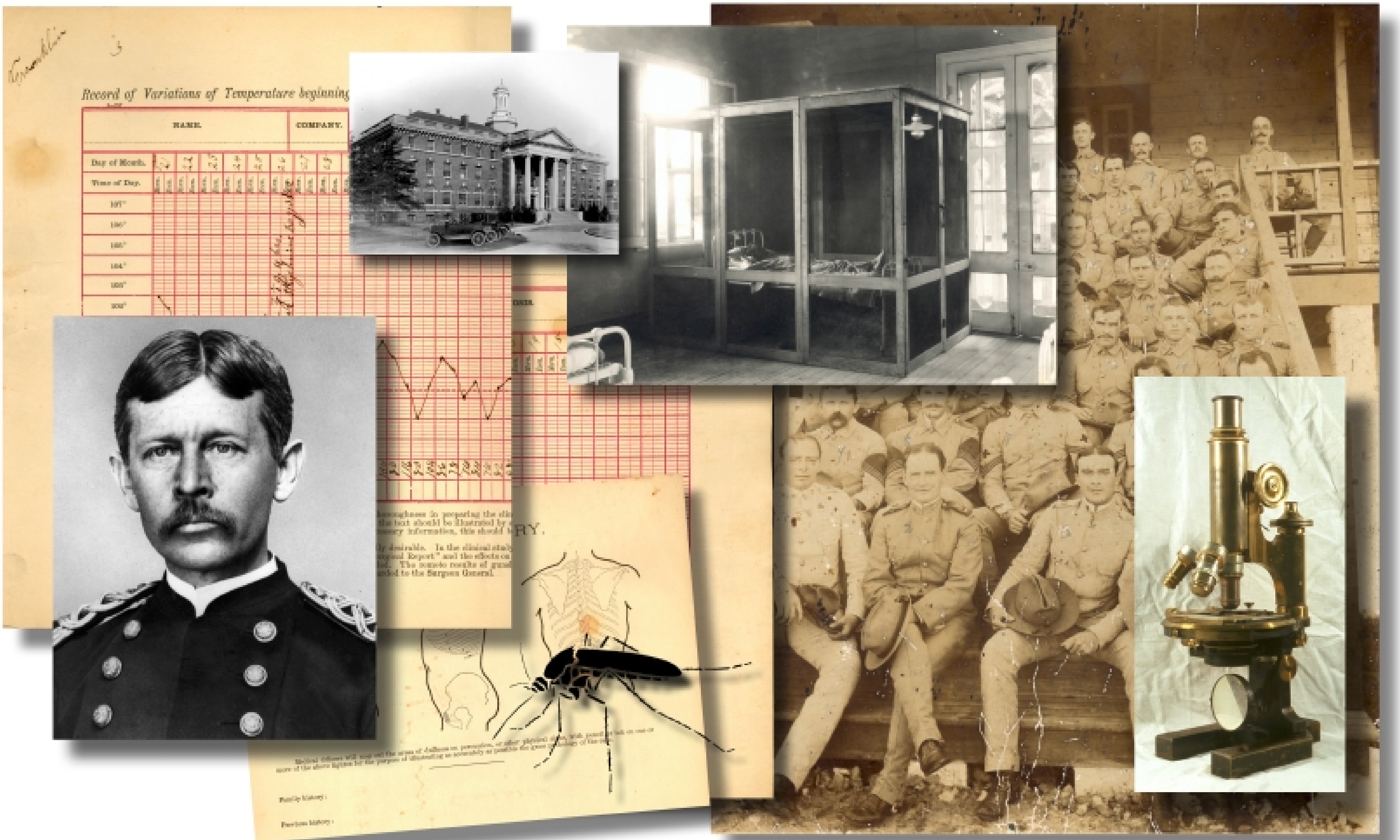
The U.S. Sanitary Commission was organized by civilians to pressure for improved conditions for Union soldiers. Clara Barton, Dorothea Dix, Sojourner Truth, Harriet Tubman and Walt Whitman nursed the Union wounded. Mary Walker became an Army contract physician. Sally Tompkins, Confederate Army captain, ran Richmond's main hospital; the Soldier's Aid and Hospital Relief Society assisted Confederate soldiers.

APRIL

S	M	T	W	T	F	S
Daylight Saving Time Begins April Fools' Day 1	2	3	4	5	6	7
Palm Sunday 8	Passover 9	10	11	12	Good Friday Jefferson's Birthday 13	14
Easter 15	16	17	18	19	20	21
Earth Day 22	23	24	Administrative Professionals Day 25	26	27	28
29	30	1	2	3	4	5

In June 1862, Surgeon General William Hammond called for the preparation of *Medical and Surgical History of the War of the Rebellion* to serve as a basis for reforms in military medicine. It included specifics about medical symptoms, surgical procedures and treatments, as well as shelter and sanitary conditions and ration preparation and character. (The sixth volume was completed in 1888.)
Hammond also issued instructions for collection of materials to illustrate battle wounds, clinical specimens, weapons and projectiles along with case histories. Thousands of items were sent to his office and became the core of the AMM, established on May 21, 1862, with Brinton as Curator. Included was the amputated leg of Maj. Gen. Daniel E. Sickles, who was hit with a cannonball during the Battle of Gettysburg. Sickles visited his leg yearly at the AMM; the fractured bones are still on display. On April 15, 1865, members of the AMM assisted at the autopsy of assassinated President Abraham Lincoln and, two weeks later, at that of his assassin John Wilkes Booth. Materials from both of those procedures are exhibited in the National Museum of Health and Medicine (NMHM).

Token issued at the Soldier's Fair, Springfield, Massachusetts, December 1864, to raise money for the U.S. Sanitary Commission.



Investigating Causes—Organisms and Vectors

Yellow fever patient's chart, 1900; Walter Reed General Hospital, 1924; Gorgas Hospital, Panama; Screening yellow fever patient to prevent infecting new mosquito carriers, Gorgas Hospital, Panama; Hospital Corps detachment with yellow fever volunteers, Cuba, 1900; Major Walter Reed; Microscope used by Walter Reed.

INFECTIOUS DISEASES IN THE MILITARY

MAY

S	M	T	W	T	F	S
29	30	1	2	3	4	Cinco de Mayo 5
Nurses Day 6	7	V-E Day 8	9	10	11	12
Mother's Day 13	14	15	16	17	18	Armed Forces Day 19
AFIP Birthday 20	Victoria Day (Canada) Army Medical Museum Founded, 1862 21	22	23	24	25	26
27	Memorial Day 28	29	30	31	1	2

Long before microorganisms were found to be the causative agents of infectious diseases, plagues and epidemics determined the outcome of battles, wars, and colonial expansion to change the course of history.

The first recorded instance of the impact of infectious disease on the military was the death of one-quarter of the Athenian troops in 430 BC during the Peloponnesian War. In the 16th century, typhus contributed to the loss of Naples by the French, the defeat of the Holy Roman Empire in the Balkans, the withdrawal of the Ottomans from Belgrade and, in the 19th century, the decimation of Napoleon's troops in Russia. Smallpox and measles aided the Spanish conquest of Mexico and Peru, the Portuguese domination of Brazil and the British colonization of North America and Australia in the 18th century. Yellow fever helped to curtail the expansion of the French into North America. Sleeping sickness was spread by Belgian expansion in central Africa and typhoid felled American troops in the 1898 Spanish-American War.

Validation of the germ theory in the late 1800s by Louis Pasteur and Robert Koch prompted a search for the agents responsible for diseases prevalent among the military. American forces took control of Havana, Cuba from the Spanish in 1899 and immediately experienced high rates of infection and death from yellow fever. A Yellow Fever Commission, consisting of Maj. Walter Reed, Lt. James Carroll, and Drs. Jesse Lazear and Aristides Agramonte, was set up by the AMM to investigate.

Dr. Carlos Finlay, a Cuban physician working with the U.S. Commission of 1879 on the yellow fever problem, had proposed that a mosquito was involved. In 1897, Ronald Ross discovered that mosquitoes transmitted the malaria that was killing British troops in India. Reed was impressed with Ross's findings and Finlay's theory. As humans are the only known victims of yellow fever, members of the Board served as test subjects. After being bitten by mosquitoes previously exposed to sick patients, Carroll nearly died and Lazear did. Lazear's careful records revealed that patients were infectious in the first three days and female mosquitoes could transmit the disease 12-20 days later.

In 1900, Reed reported, "The mosquito acts as the intermediate host for the parasite of yellow fever." Further experiments confirmed his conclusion. Insect control measures implemented immediately by Dr. William Gorgas, Chief Sanitary Officer in Havana, resulted in a drop in the number of cases to zero within two years.

The conquest of yellow fever led to the completion of the Panama Canal, abandoned by the French in 1889 due to heavy mortality from the disease. Maj. Reed returned to the AMM as Curator until his death from appendicitis at the early age of 51. (The agent of yellow fever was found later to be a virus.)

Medallion presented to Walter Reed posthumously by the U.S. Congress in recognition of his leadership of the Yellow Fever Commission. The medallion was struck in 1929 and presented to all the members of the Commission.

Preventive Measures for Disease Agents

World War I education slide; Condom distributed by Health Education Resource Organization, Baltimore, MD, ca. 1988; General William C. Gorgas at the time of the construction of the Panama Canal, ca. 1905; Microslide preparation of lice; World War II health posters; Man with polio in iron lung; Emerson model SC iron lung; Bedbug, photographed by J. J. Woodward, ca. 1870s; Salvarsan (anti-syphilitic) distributed by New York State Department of Public Health, ca. 1940; Oil-spraying truck for mosquito eradication, Casablanca, North Africa, 1943.

PUBLIC HEALTH

JUNE

The basic principles of public health – sanitation and protection of food and water supplies – were practiced in ancient Egyptian, Greek, Roman, and Hebrew civilizations. These measures, which broke down during the Middle Ages with pollution from the rapid growth of urban populations, were revived in the 19th century.

Edwin Chadwick's 1842 survey of British social class and disease revealed that sickness bred poverty, a reversal of the prevailing view. His advocacy of prevention of illness through improvement in workers' living conditions energized the sanitarians whose efforts led to drastic reductions in many infectious diseases.

Sanitary reform began slowly in the U.S. Municipal health laws enacted in the 1790s in New York and other large east coast cities were reactive to epidemics. The poor sanitary conditions in the Civil War served as a watershed in the history of American public health. By 1866, metropolitan health boards oversaw garbage collection, prohibited free-roaming livestock, regulated water supplies and cemeteries, authorized quarantine of ill persons, and set up sewer systems.

Cleanliness became a moral issue. Vital statistics were compiled. Conflicts between the rights of individuals and government mandates hampered rapid progress in public health. Home inspections and health surveys were viewed as invasions of privacy. State health boards, formed in the 1890s, coordinated local efforts. By the end of the 19th century, the Marine Hospital Service, created in 1798 to care for sailors, was the chief federal health agency. It is now called the Public Health Service.

Gradually, prosperity led to an increased standard of living. Early 20th century public heath departments focused on vaccination programs, mosquito control, quarantine, specialized clinics and education. The Pure Food and Drug Act (1906) was passed to provide quality control of foods and medicines.

The high medical rejection rate of recruits in WWI increased public awareness of the importance of health. The veil of silence surrounding venereal diseases lifted. Interest in infant mortality, occupational and mental illnesses, and chronic health problems grew. Private foundations supplemented federal funding of health programs. Major advances in medical treatment, especially during WWII, raised the stature of public health physicians.

By the mid-20th century, public health concerns shifted again. Problems concerning senior citizens, radiation and environmental hazards, sex education, and industrial hygiene were confronted. Now public health is monitored by a variety of government agencies (Centers for Disease Control and Prevention, Environmental Protection Agency, Occupational Safety and Health Administration, National Institutes of Health, state public health departments) and protected by numerous laws and regulations.

S	M	T	W	T	F	S
27	28	29	30	31	1	2
3	4	5	D-Day 6	7	8	9
10	Queen's Birthday-UK 11	12	13	Flag Day 14	15	16
Father's Day 17	18	19	20	First Day of Summer 21	22	23
24	25	26	27	28	29	30

Medallion commemorating pestilence outbreak in Hamburg, Germany, 1714.

Advances in Surgery

Wounded arriving at triage station, Suippes, France; Diagnosis tag book, tied to wounded soldier after triage; Anti-venereal disease educational lantern slide shown to troops; Shell shock effects, Courboin, France; Individual first aid dressing; Curtiss Jenny airplane ambulance; Gas defense instruction—Nurse with gas mask adjusted; Wounded being cared for in old church in France on September 20, 1918.

WORLD WAR I

The Great War (1914-1918) brought worldwide misery on a colossal scale. Military and civilian deaths exceeded 16.8 million; military losses averaged 5,509 every day. Nearly 11% of France's total population, 8% of Great Britain's, 9% of Germany's and 0.37% of America's were killed or wounded.

New ways of waging war, including the flying of German zeppelins and American, British and German airplanes contributed to the devastation. Explosive shells, machine guns, flame throwers, poison gases, explosive mines, tanks and prolonged artillery barrages changed the character of ground warfare. Wounds inflicted by these weapons challenged army medical teams to devise new treatments.

Field hospitals behind the front lines were optimized for emergency surgery, stabilization and resuscitation; blood transfusions became routine. New and improved surgical retractors, hemostats, hypodermic syringes and portable x-ray machines were introduced. Rapid treatment and evacuation saved the lives of 19 million wounded. Medical teams from humanitarian agencies, such as the League of Nations and International Red Cross, helped ease the suffering.

Demand for orthopedic surgeons escalated; prosthetics were designed for a half-million amputees. Trench warfare increased the incidence of facial injuries, necessitating a new specialty, plastic and reconstructive surgery. Shell shock, first thought to be malingering, was recognized as severe mental trauma induced by the horrors of war. Psychiatrists were trained to treat and screen recruits for mental illness.

Boundaries between civilian and military medicine and science blurred. Studies of chemical warfare by physiologists opened up the specialty of pulmonary medicine.

JULY

S	M	T	W	T	F	S
Canada Day 1	2	3	Independence Day 4	5	6	7
8	9	10	11	12	13	Bastille Day 14
15	16	17	18	ARP Birthday 19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4

Gas masks prevented lung damage and oxygen therapy reversed it. Medical screening of recruits and the use of EKG traced the cause of "soldier's heart" (chest pain, palpitations on exertion, exhaustion) to prior bacterial infections and poor physical conditioning of volunteers. Cardiology evolved from extensive studies of heart disease (third leading cause of discharge in the British military). Attempts to encourage abstinence, use of prophylactics and condoms, and patronage of state-controlled brothels did little to decrease the high incidence of venereal diseases in soldiers far from home.

At America's entry into the war (1918), the AMM made motion pictures, photographs, wax models, casts and lantern slides to train troops and medical officers in handling battlefield activities and treating wounded troops. *Fit to Fight* was prepared as a venereal disease "photoplay." The AMM archives acquired more than 6,000 new pathological specimens.

Increased staffing of post-war rehabilitation centers with psychiatrists signaled the recognition that veterans were no longer "cannon fodder" but the valued fathers, husbands, sons and brothers of every citizen.

Badge of the U.S. Army Ambulance Service, Italy, 1917-1919.

Correcting Disabilities

Patient at Walter Reed Hospital, ca. 1950; Saver Brucke Artificial Hand's interior mechanism; Terminal prosthesis, APRL Sierra Hand, ca. 1950; Private Columbus Rush demonstrating his artificial legs after the Civil War; Artificial leg designed by Civil War Surgeon A. J. Watson, ca. 1867; Variable Axis Total Knee, ca. 1974; Pean's artificial shoulder joint prosthesis, implanted 1893; Patient's prosthetic arms at Bushnell General Hospital, 1945; Sample artificial legs with rubber feet manufactured by A. A. Marks, ca. 1895.

REHABILITATION AND PROSTHETICS

The use of water, heat, cold, light and massage to restore function to disabled and chronically ill persons was recorded in ancient Greece. Physical activity was prescribed in ancient Egypt, and 18th century insane asylums offered work therapy. Electro-therapy was used in 19th century America to treat gynecological and nervous disorders.

During the first two decades of the 20th century, an urgent need to improve delivery of treatment to disabled persons arose. In America, nearly 500,000 injured industrial workers and more than 123,000 wounded soldiers from WWI required care. In 1918, physicians practicing industrial medicine, newly recognized as a specialty by the AMA, and the Army's Division of Physical Reconstruction tackled the problem. Physical therapeutics added the modalities of heat, water, light and mechanical vibration to the electricity already in use.

The professions of physical and occupational therapy developed to augment the efforts of physiatrists. John Coulter, an early physical medicine practitioner at Northwestern University, established courses in medical schools after WWI. The first course in physical therapy for nonphysicians (set up at the Walter Reed Hospital in 1918) expanded to 14 colleges and schools. Postwar treatment of wounded soldiers was extended to industrial accident victims and the chronically ill. Rehabilitation programs incorporated massage, exercise, vocational training, and job placement.

A devastating polio epidemic and America's entry into WWII in 1941 further taxed the system of rehabilitation medicine. Sister Elizabeth Kenny revolutionized the treatment of polio victims by advocating heat and motion, not immobility. In 1942, Howard Rusk, a WWII pioneer in rehabilitation medicine, created the Army Air Force Convalescent Training Center and later headed the Institute of Rehabiltation Medicine (NYU). Rusk and Frank Krusen, promoters of physical medicine at the Mayo Clinic since the 1930s, were consultants to the postwar VA headed by General Omar Bradley. Rehabilitation nursing was recognized as a specialty in the 1940s. Vision, hearing, and speech therapists became important participants in rehabilitation. Now, computers aid communication and mobility of the disabled.

Integral to restoration of the wounded was the fitting of prostheses to replace missing body parts. French surgeon Ambroise Paré pioneered prosthetics in the 16th century. Gradually, metal hands were replaced by leather or wooden models. Lightweight materials and smoothly functioning mechanical joints emerged from technologies developed during and after the two World Wars. A metal mechanical hand covered by a rubber glove colored to match the patient's skin was developed at the U.S. Army Prosthetic Research Laboratory in the 1950s. Today, patients control the activation of electrodes to permit fine hand movements.

AUGUST

S	M	T	W	T	F	S
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	V-J Day 14	Assumption 15	16	17	18
19	20	21	22	23	24	25
Women's Equality Day 26	27	28	29	30	31	1

Emma Vogel Award for Outstanding Achievement in Physical Therapy, named in honor of the chief of Physical Therapy at Walter Reed Army Hospital (1920-1942) and first director of the Women's Medical Specialist Corps (1947-1951).

Rapid Treatment of Acute Injuries

US Hospital Ship *Chateau Theirry*; Yank medics treat the wounded leg of a GI near Metz, France; Hiroshima after atomic bomb, 1945; Container that held whole blood shipped to field hospitals; Pocket Surgical Kit, ca. 1942; The First US Army nurses marching; American soldier wounded by shrapnel being given blood plasma; Surgery tent in South Pacific showing operating table made of stretcher and boxes, 1943; Patients on a hospital train; American Campaign and Service Medal, 1941-1945; National Defense Medal, 1941-1945.

WORLD WAR II

Between 1939 and 1945, the world engaged in a second conflict that surpassed the devastation of the Great War of 1914-1918. Varied geography and improved weapons presented new challenges to military medical units charged with conserving the fighting strength of the Armed Forces.

America entered the war in 1941 with soldiers vaccinated against typhoid fever and typhus. Dusting with DDT killed typhus-spreading lice; Atabrine staved off malaria. Trench foot, fungal infections and dysentery were prevalent in the Pacific jungles. The Army Institute of Pathology (AIP, a division of the AMM) provided training in the pathology of tropical diseases.

The wounded were treated at field units at the front and transported to battalion aid and division clearing stations, field and evacuation hospitals and, farthest from the action, general hospitals. Medical teams were air-dropped into battle arenas and the wounded removed by air transport. Massive transfusions with plasma and preserved (1943) and refrigerated (1944) whole blood reduced wound shock. Antiseptic and aseptic procedures became routine. Sulfa drugs (1930s) prevented many infections and the new wonder drug penicillin was provided to troops in 1944. All soldiers were trained in emergency first aid. Rapid treatment of 68% of wounded within the first 12 hours resulted in a survival rate of 97%.

Airmen wore thermal flight suits to reduce frostbite in the subzero temperatures of high altitude and oxygen masks to prevent blackouts. Flak jackets partially protected against wounding.

Large naval forces (ships and submarines) were deployed. Mobile medical units landed with the troops and casualties were transported in landing boats to large hospital ships. Burn rates were high on aircraft carriers and other ships attacked by Japanese kamikazes and on land from flame-throwers and tanks.

Combat fatigue led to inefficiency in troops kept in battle for long periods and psychological reactions were a major reason for discharge. A first attempt at rotating tours of duty was established for pilots. Extensive postwar emotional, occupational, and rehabilitation efforts were undertaken. In 1945, the AIP became the central pathology laboratory for the Veterans Administration, a successor to the Civil War Veterans Pension Bureau.

Refugees from war zones and released prisoners of war spread diseases throughout Europe. The destructive effects of nuclear energy were seen for the first time following the A-bombings of Hiroshima and Nagasaki in 1945. An estimated 55 million people from 61 countries perished during WWII, including 30 million civilians.

SEPTEMBER

S	M	T	W	T	F	S
26	27	28	29	30	31	1
2	Labor Day 3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	Rosh Hashanah 19	20	21	First Day of Autumn 22
23/30	24	25	26	27	Yom Kippur Native American Day 28	29

Unit Crest, Walter Reed Army Medical Center.

Noninvasive Diagnostic Procedures

Private John Sullivan's hand wound from the Spanish-American War; World War I era x-ray equipment; Army x-ray ambulance during World War I; Hologram made from Visible Human Project; Adrian Shoe Fluoroscope, ca. 1930; Full body x-ray of a woman, ca. 1960s; Four views of footbinding; X-ray of foot, showing properly fitted shoe; Spanish-American War soldier with bullet at the base of his skull.

OCTOBER

IMAGING

One early nonsurgical "view" inside the human body utilized sound. Laennec's stethoscope (1816) provided information about the chest and its diseases. The speculum was resurrected in 1816. By 1850, reflected focused light (ophthalmoscope) illuminated the retina and optic nerve in the eye. Soon, the laryngoscope (1857), esophagoscope (1868), gastroscope (1868) and rectoscope (1895) were exploring body cavities.

The discovery of x-rays (1895) by Wilhelm Roentgen (1901 NP Physics) revealed previously inaccessible interiors, with details recorded on photographic films. At nearly the same time, the fluoroscope provided views of organs and tissues in motion. The medical and scientific communities immediately adopted x-ray technology (the AMM acquired an x-ray machine in 1896 for use in retrieving foreign objects). Numerous nonmedical uses were found for x-irradiation and public fears of invasion of privacy became the subject of cartoonists. Within a year of Roentgen's discovery, Harvard physiologist W.B. Cannon visualized the digestive tract by feeding a bismuth compound to subjects (now supplemented by endoscopy). By 1900, x-rays were widely used in physical exams and were accepted as evidence in medical malpractice suits. Today, images are stored digitally.

In 1972, Godfrey Hounsfield (1979 NP Phys & Med) took x-ray technology to a new level by developing the CAT scanner and coupling it with a computer to generate a 3-D body image. The speed of CAT scans has increased from hours to seconds; spiral scanners collect images of the chest, lungs, abdomen and bones and are used in virtual endoscopy. New fluoroscopic CAT procedures guide surgeons in performing biopsies, microsurgery and microtherapy.

In 1975, Richard Ernst (1991 NP in Chemistry) adapted the magnetic resonance of hydrogen atoms in water and fat to body imaging (MRI). A newer imaging technology (SQUID) can detect weak magnetic fields generated by brain and heart electrical activity. Hyperpolarized gases are used to evaluate lung function.

Advances were made in functional imaging. PET detects gamma rays (produced by the interaction of an injected positron-emitting compound with electrons within the body) to visualize heart and brain function and to localize and grade tumors. Single photon emissions generate images using SPECT. Reminiscent of Laennec, ultrasound (Ian Donald-1950) uses high frequency soundwaves to image without electromagnetic radiation.

In 1990, the NMHM acquired a fluoroscope, a standard but hazardous feature of shoe stores in the 1940s and 1950s. Investigators at the AFIP and AFME use digital image processing to establish causes of death and to identify disaster victims. The Visible Human Project of the NLM is generating a digital image library of the interior of a normal adult male and female using CAT, MRI and cryosection images.

S	M	T	W	T	F	S
30	1	2	3	4	5	6
7	Columbus Day Thanksgiving Day (Canada) 8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	United Nations Day 24	25	26	27
Daylight Saving Time Ends 28	29	30	Halloween 31	1	2	3

Medallion of Wilhelm Roentgen presented by the American Roentgen Ray Society as an award for scientific exhibits, ca. 1940.

Technological and Pharmacologic Advances

The 8055th Mobile Army Surgical Hospital (M.A.S.H.) at Yongdungpo, Korea; *Ambroise Pare in 1510*, oil painting of pioneering military surgeon; Surgery on Private Connell, 1943; Surgery to re-unite bone during World War I, illustrated by E.F. Faber; Surgical kit for the internal fixation of bone fractures, Japan, ca. 1944; A surgical operation during World War I; Operating room in Cuba after Spanish-American War; Starr-Edwards heart valve prosthesis, ca. 1970; Surgery at the 11th Evacuation Hospital in Korea; Skull showing trephination of face to remove bone splinters, Private J. Lumen, wounded November 27, 1863; Surgery at Medical Unit Self-Contained Transportable (M.U.S.T.) Hospital, Vietnam.

NOVEMBER

SURGERY

Surgery was, by necessity, one of medicine's earliest specialties. Primitive humans set broken bones with wood splints and clay casts and closed flesh wounds using hot stones. The Smith papyrus from ancient Egypt contains the earliest known writings on surgery dating to 3000 BC. Alcohol deadened pain; opium was introduced in 300 BC. Metal surgical instruments dating to 800 BC are similar to those used today.

In the 14th to 16th centuries, surgery flowered in parallel with detailed anatomical depictions, and the introduction of gunpowder increased the need for new surgical procedures. In 1540, King Henry VIII of England chartered the Barber-Surgeons' Company.

Medical research in the 17th and 18th centuries led to more complex surgical procedures. The surgeons separated from the barbers in England (1745) and France (1743). Two British anatomists, William and John Hunter, opened a school (1740) to train surgeons. Centers specializing in surgery for a variety of common conditions including goiter, appendicitis, and hernias developed in France, Germany and Italy.

The discovery of the anesthetic effects of nitrous oxide, carbon dioxide, ether, and chloroform in the first half of the 19th century allowed more invasive surgery. Cocaine, and its successor procaine, appeared at the end of the century. Theodor Billroth advanced surgery with anesthesia at his world-renowned Vienna clinic (late 19th century) and pioneered abdominal surgery.

Survival rates improved dramatically with the introduction by Joseph Lister of antisepsis and the use of cotton gloves; Halsted popularized rubber gloves (1890). The discovery of antibiotics — sulfanilamide (1935), penicillin (1944), streptomycin (1943) — decreased postoperative infections. The muscle relaxant curare was introduced clinically in 1939.

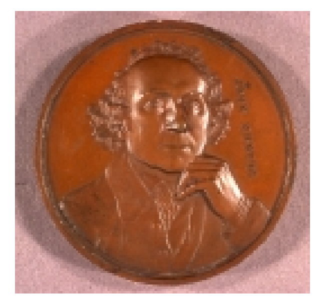
S	M	T	W	T	F	S
28	29	30	31	All Saints' Day 1	2	3
4	5	Election Day 6	7	8	9	10
Veterans Day Remembrance Day (Canada) 11	12	13	14	15	16	17
18	19	20	21	Thanksgiving Day 22	23	24
25	26	27	28	29	30	1

Surgical specialties developed in the 20th century and by 1950 residencies were available in every organ system.

Operations became increasingly complex, involving the repair and reconstruction of damaged and diseased organs and vessels. Rudimentary plastic surgery for facial wounds, dating to the 1st century BC, and orthopedic surgery for limb and hand deformities, developed in the 17th and 18th centuries, were refined as separate specialties during the two World Wars.

Neurosurgery began in 1885 in London. Karl Landsteiner's discovery of the ABO (1900) and Rh (1935) blood groups initiated typing for compatibility of blood during operations requiring transfusions. In the 1940s, Sir Peter Medawar's immunological studies on tolerance of skin grafts began the era of organ transplantation. With immunosuppressants such as cortisone (1951), azathioprine (1959) and cyclosporin (1965), kidney, heart and liver transplants have become routine. More dramatic accomplishments are transplantation of lungs and hands.

Medallion struck in honor of John Hunter by St. George's Hospital, Greece in 1850.



Patient Care Built on a Scientific Basis

Dental Health Week, February 22-28, 1925; Plastinated preparation of the human brain; Dental public education effort, 1935; Human hand, papier-mâché model by Jerome Auzoux, 1894; Book: ***The Microscope and its Revelations*** by William B. Carpenter, 8th ed. Philadelphia: Blakiston's Son & Co., 1901, plate XX; Plaster cast of medal struck in honor of William Welch, 1910; Human tongue, papier-mâché model by Jerome Auzoux, 1901; Human fetus, papier-mâché model by Jerome Auzoux; Private Milton Wallen suffering from gangrene during the Civil War, painting by Edward Stauch published in the *Medical and Surgical History of the War of the Rebellion*, Surgical vol. II, p. 739; Lecture room at Fort Union, New Mexico in the 1880s; Moulage kit, ca. 1950, containing fake wounds used to train medics in field trauma.

MEDICAL EDUCATION

DECEMBER

From Ancient Greece and Rome to the second half of the 19th century, physicians were trained primarily in apprenticeships with healers. The Salerno (Italy) medical school (founded in the 11th century) and other important European medical centers provided limited academic training for physicians.

Medical education in colonial America was available through self-study, a short course in a proprietary (physician-run, for-profit) or university medical school, or training in Europe.

The inadequacies of Civil War medicine and the growing importance of science in medicine underscored the need to improve the training of doctors. In 1871, Harvard University merged its medical school with the university and emphasized practical experience ("learning by doing") as opposed to didacticism. Entrance and graduate requirements were instituted; the curriculum was extended to three years with an ordered progression of minimal basic science and clinical courses.

The new Johns Hopkins Medical School (1893), incorporating the Harvard reforms into a hospital-linked medical education, was designed by J. S. Billings (Curator and Librarian of the AMM, 1883-93). He and University President D.C. Gilman hired an illustrious faculty (W. Osler, W.H. Welch, W.S. Halsted, H. Kelly) who introduced additional reforms. It presented a radical model for progressive medical education by adding clinical teaching and research to the curriculum. Medicine began to attract the brightest college students, the profession became prestigious, and Americans no longer needed to travel to Europe to acquire laboratory skills.

In 1910, the prominent educator A. Flexner published *Medical Education in the United States and Canada*, an exhaustive survey of 162 medical schools. His endorsement of the Johns Hopkins system as the gold standard led to the demise of the remaining proprietary schools and sped the development of the university-based medical school with a large full-time faculty and a vigorous commitment to research. A uniform course of study and imposition of state licensing laws (1930s) assured the public of qualified physicians.

The emphasis on medical education as a hands-on discipline required well-equipped laboratories and innovative approaches. Private individuals and philanthropies contributed vast sums of money for the physical plants and professional salaries that the Flexner report supported. Teaching aids were developed. The preparation of moulages (wax models of skin disorders and wounds) became a fine art in Germany, England and France in the 18th and 19th centuries. By the 1950s, medical illustration departments were important components of medical schools and provided drawings, projection slides, models, photographs and films. The rapid increase in medical knowledge, especially during the 1960s, increased the importance of residencies and post-graduate courses to keep practicing physicians current in their specialties.

S	M	T	W	T	F	S
25	26	27	28	29	30	1
First Day of Advent 2	3	4	5	6	Pearl Harbor Day 7	8
9	10	First Day of Hanukkah 11	12	13	14	15
16	17	18	19	First Day of Winter 20	21	22
23/30	24/31	Christmas Day 25	Kwanzaa Boxing Day 26	27	28	29

Medallion, London Hospital School of Medicine, date unknown.

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TIMELINES

Institutions Associated with the AFIP:
- Army Medical Museum (1862-1944)
- Army Institute of Pathology (1946-1949)
- Armed Forces Institute of Pathology (1949-present)

National Museum of Health and Medicine:
- Army Medical Museum (1862-1946)
- Medical Museum of the Army Institute of Pathology (1946-1949)
- Medical Museum of the Armed Forces Institute of Pathology (1949-1974)
- Armed Forces Medical Museum (1974-1989)
- National Museum of Health and Medicine (1989-present)

National Library of Medicine:
- Surgeon General's Library (1836-1883)
- Army Medical Museum and Library (1883-1956)
- National Library of Medicine (1956-present)

Walter Reed Army Institute of Research:
- Army Medical School (1893-1923)
- Medical Department Professional Service Schools (1923-1947)
- Army Medical Department Research and Graduate School (1947-1953)
- Walter Reed Army Institute of Research (1953-present)

American Registry of Pathology:
- Registry of Ophthalmic Pathology (1921)
- American Registry of Pathology (1930)
- Congressional act to establish ARP as a non-profit corporation (1976)
- ARP as fiduciary agent for consultation, education, and research programs (1990)

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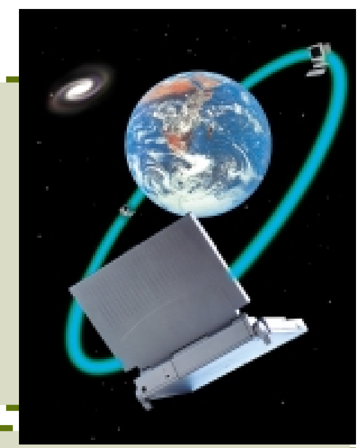

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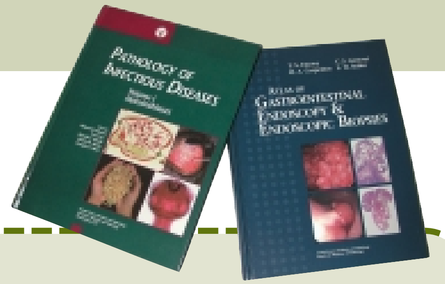

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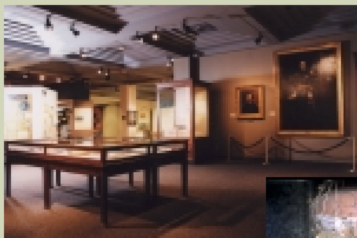

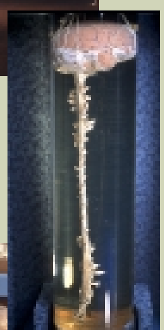

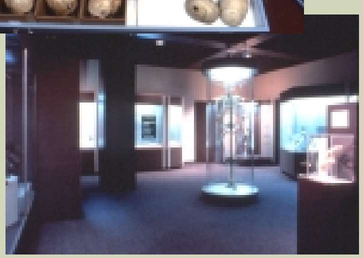

PHOTOGRAPHY REFERENCES

JANUARY—Developing an Understanding of Cells and Tissues

Diatom photographed by J. J. Woodward, ca. 1876;
(M-030 00655) Leeuwenhoek microscope (reproduction);
(M-030 00376) Microscope used by Robert Hooke, ca. 1665;
(NCP 2810) Walter Bulloch Congress binocular microscope;
(NCP 3685) Electron microscope pieces;
Beck catalogue page, 1870s;
(NCP 3687) View of three electron microscopes;
Book: *Common Objects of the Microscope* by J. G. Wood;
(M-040 00007) Microscopic preparations by Abraham Ypelaar, ca. 1785.

FEBRUARY—Understanding the Mechanisms of Disease

Book: *Gunshot Injuries* by Louis A. LaGarde, New York: William Wood, 1914;
(SP 21) Civil War soldier's skull, fractured by grapeshot;
(NCP 3940) Pathologist studying brain sections;
(NCP 3939) Pathologist working at AFIP, ca. 1950s;
(Haymaker collection) Dr. Webb Haymaker examining brain;
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(NCP 3357) Normal human lung;
(NCP 408) Acute granulocytic leukemia cells in heart;
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(NCP 455) Mustard gas burn on neck;
(MIS 56-21727) New AFIP building in 1956;
(M-660 10014 - M-660 10019) Histological stains, ca. 1910;
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(Reeve 157a) Method of vaccination at Army Medical School, ca. 1918;
(M-550 00018) Smallpox model by William Gottheil, ca. 1918;
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(M-179 00155) Prototype "Press-O-Jet" immunization gun, ca. 1955;
(Reeve 167) Soldiers being vaccinated at Army Medical School;
(Reeve 32486) Vaccinated infant and mother with smallpox;
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(CP 1563) Amputation with anesthesia;
(AFIP 384,637/ 1,000,313) Pelvis and femur from Private Julius Fabry, wounded August 16, 1864;
(Woodward 1760) General Daniel Sickles after amputation;
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Cartes des visites of Museum specimens;
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(MIS 62-5062) Museum curator John Brinton (center with beard) at Petersburg, VA, collecting for Museum, 1864;
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(Acc. 29719) Lincoln's deathbed by Hermann Faber, 1865.

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(Walter Reed Army Medical Center Historical Files, Box 5) Walter Reed General Hospital, 1924;
(Reeve 62711) Gorgas Hospital, Panama. Screening yellow fever patient to prevent infecting new mosquito carriers;
(Sontag Collection) Hospital Corps detachment with yellow fever volunteers, Cuba, 1900;
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(M-030 00420) Microscope used by Walter Reed.

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(Reeve 62703) General William C. Gorgas at the time of the construction of the Panama Canal, ca. 1905;
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(NCP 3631) Man with polio in iron lung;
(M-710 00035), Emerson model SC iron lung;
(New Series 455) Bedbug, photographed by J. J. Woodward, c. 1870s;
(M-660 35101) Salvarsan (anti-syphilitic) distributed by New York State Department of Public Health, ca. 1940;
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(Reeve 016246) Shell shock effects, Courboin, France;
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(Reeve 017633) Curtiss Jenny airplane ambulance;
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(M-350 10195) American Campaign and Service Medal, 1941-1945;
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(CP 3327) Private John Sullivan's hand wound from the Spanish-American War;
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(M-736 10036) Adrian Shoe Fluoroscope, ca. 1930;
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CP 3324) Spanish-American War soldier with bullet at the base of his skull.

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(M-129 00109), Surgical kit for the internal fixation of bone fractures, Japan, ca. 1944;
(SC 187247) Surgery on Private Connell, 1943;
(Reeve 32478) A surgical operation during World War I;
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(M-151 11070) Starr-Edwards heart valve prosthesis, ca. 1970;
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(AFIP 1,001,067) Skull showing trephination of face to remove bone splinters, Private J. Lumen, wounded November 27, 1863;
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(Hollister collection) Dental Health Week, February 22-28, 1925;
Plastinated preparation of the human brain;
(Hollister collection) Dental public education effort, 1935;
(M-550 10524) Human hand, papier-mâché model by Jerome Auzoux, 1894;
Book: *The Microscope and its Revelations* by William B. Carpenter, 8th ed. Philadelphia: Blakiston's Son & Co., 1901, plate XX;
(M-902 00245) Plaster cast of medal struck in honor of William Welch, 1910;
(M-550 10264) Human tongue, papier-mâché model by Jerome Auzoux, 1901;
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Private Milton Wallen suffering from gangrene during the Civil War, painting by Edward Stauch published in the *Medical and Surgical History of the War of the Rebellion*, Surgical vol. II, p. 739;
(CP 3209) Lecture room at Fort Union, New Mexico in the 1880s;
(M-728 10096) Moulage kit, ca. 1950, containing fake wounds used to train medics in field trauma.

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MARCH

APRIL

MAY

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AUGUST

SEPTEMBER

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